



River Hydrology Monitoring: Water Year 2021

The Sierra Nevada Network (SIEN) River Hydrology Monitoring Protocol reports on 14 stations located throughout Devils Postpile National Monument (DEPO), and Sequoia (SEQU), Kings Canyon (KICA), and Yosemite (YOSE) national parks (Figure 1). The purpose of this resource brief is to disseminate information on this data collection and the dataset access for the three SIEN-managed sites for water year 2021 (October 2020 - September 2021).

Streamflow Connections

Streamflow data can be used along with SIEN lakes and wetlands data to understand and monitor interconnected components of the big-picture systems throughout the region.

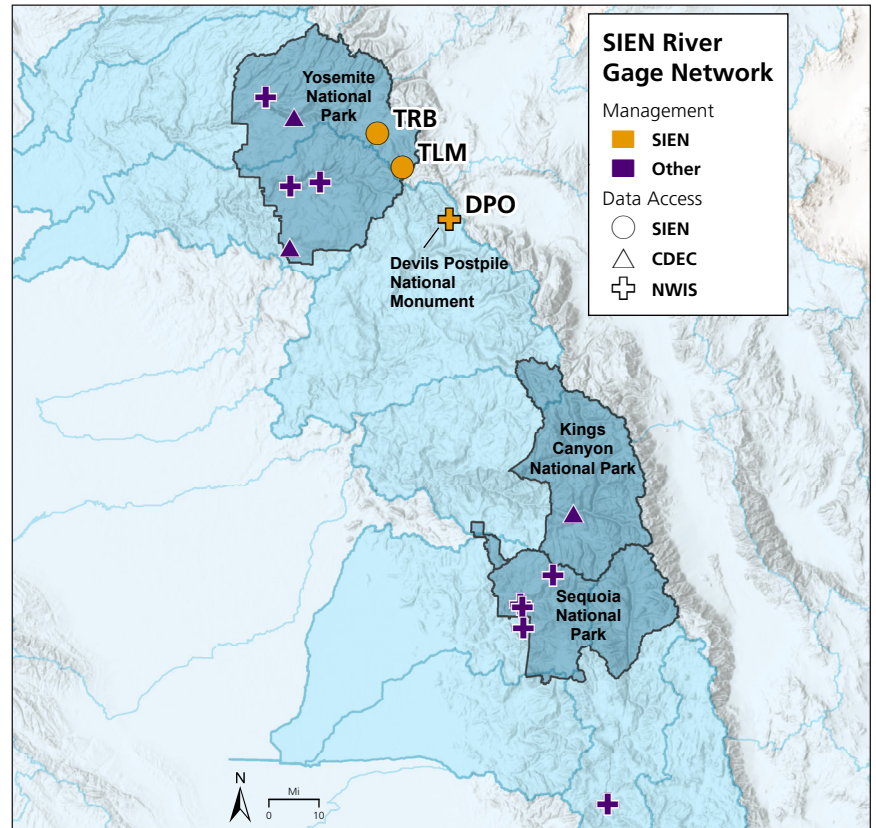
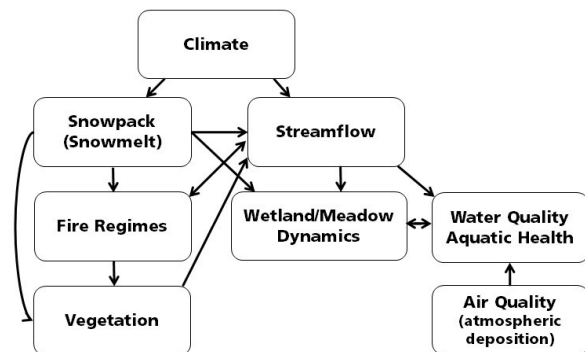


Figure 1. Gages included in the SIEN rivers monitoring protocol. Orange-colored symbols indicate the SIEN-managed gages (TRB and TLM in Yosemite and DPO in Devils Postpile) that are reported on in this brief. Data access is available from SIEN, the California Data Exchange Center (CDEC), or the USGS National Water Information System (NWIS), depending on who manages the gage. Map by K. Bessem and A. Eddy.

Measuring a River's Vital Signs



Annalise Decker, Physical Science Technician, prepares for a salt dilution discharge measurement, Lyell Fork Tuolumne River, Yosemite National Park. NPS / R. Hallnan

A river acts as a living entity, with a pulse, temperature, and flow. The SIEN rivers protocol uses the surface water dynamics vital sign to measure these qualities. The primary goal of the project is to monitor long-term trends in surface water hydrology and water temperature so managers can better understand how aquatic resources are changing, especially in the face of climate change, and use this information to inform planning and management decisions.

Information collected can address a wide range of questions related to surface water dynamics, including:

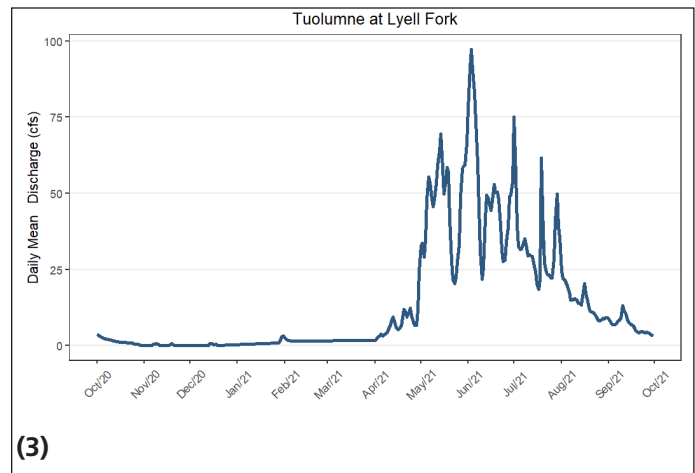
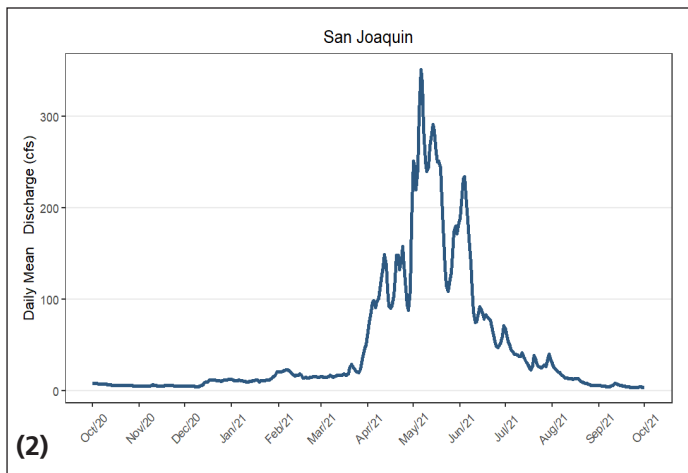
How are climatic trends affecting regional water and fire regimes?

How are stream and river discharge rates, and the timing and magnitude of peak flows changing?

How are water dynamics changing in response to climate change and fire regimes?

Measurements for timing and volume of streamflow are taken by fixed, continuous water stage recording stations and accompanying continuous temperature loggers. To capture large-scale patterns, gages were selected across varied elevations within the different SIEN watersheds. The SIEN protocol leverages a network of existing stream gages and associated long-term records, which range from 3 to 104 years in length.

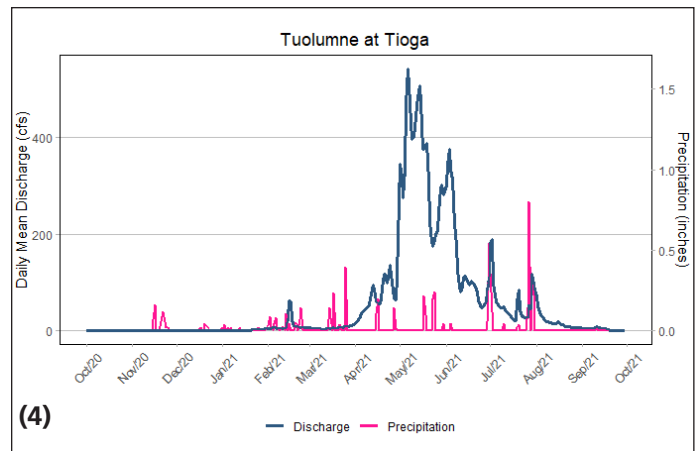
What did Rivers Look Like This Water Year?



Figures 2-4. Mean discharge in cubic feet per second for the three SIEN river protocol gage stations during the 2021 water year. Figure 4 (right) shows both discharge (blue) and precipitation (pink) for the Tioga Gage.

Highlights for Water Year 2021

The hydrographs show typical snowmelt runoff patterns (figures 2-4), although with lower than average flows. Drought conditions continued in California and the Sierra Nevada this year. The April 1st snow water equivalent (SWE) was 59% of normal statewide, 43% of normal in the southern Sierra Nevada, and 63% in the central Sierra Nevada. SWE is a measure of the water content available in the snowpack.



River Hydrology Monitoring Project Updates

SIEN is collaborating with Dr. Safeeq Kahn at the University of California (UC) on a trend analysis for the River Hydrology Monitoring Protocol. The project will investigate long-term trends in river hydrology and water temperature at 14 gages and consider covariates that may explain observed patterns. We aim to have an improved understanding of how climate change and fire are affecting streamflows and water temperature. Products will be available in late 2024 and include 1-2 journal publications, a comprehensive report, and published datasets.

Upstream of SIEN gage TR120, Tuolumne Meadows crews are completing river bank restoration that will help stabilize the bank and protect the bridge abutment there. Since TR120 is near the bridge, crews next year will focus on how these restoration efforts may affect the gage rating curve.

Contact Information and Gage Data Access

Contact Andi Heard (andi_heard@nps.gov), Physical Scientist, Sierra Nevada Network, for more information and assistance with data access.

[Sierra Nevada Network Inventory & Monitoring Program website](#)

Skancke J and Others. 2017. [Sierra Nevada Network river hydrology monitoring protocol: Narrative version 1.0](#). National Park Service. Fort Collins, Colorado.

Lyell Fork of the Tuolumne below Maclure: https://irma.nps.gov/aqwebportal/Data/Location/Summary/Location/SIEN_YOSE_TUOLLYFK/Interval/Latest

Tuolumne River at Tioga Road Bridge: https://irma.nps.gov/aqwebportal/Data/Location/Summary/Location/SIEN_YOSE_TUOLTIRO/Interval/Latest

Devils Postpile: USGS National Water Information System (NWIS), station id 'USGS 11224000 MF SAN JOAQUIN R NR MAMMOTH LAKESCA'.

Brief text by Andi Heard and Kelly Bessem, graphs by Morgan Baker.